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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Paper No. 14

Application Number: 09/781,730
Filing Date: February 12, 2001
Appellant(s): FARQUHAR ET AL.

Jack Freidman
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed June 30, 2003.

(1) Real Party in Interest

A statement identifying the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

A statement identifying the related appeals and interferences which will directly affect or be directly affected by or have a bearing on the decision in the pending appeal is contained in the brief.

(3) Status of Claims

The statement of the status of the claims contained in the brief is correct except for claim 31 is now objected to as it is allowable subject matter depending upon a rejected base claim.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Invention

The summary of invention contained in the brief is correct.

(6) Issues

The appellant's statement of the issues in the brief is correct except for the following:

Regarding applicants issue 1, the rejection of claim 48 under 35 USC 112 is withdrawn.

Regarding applicants issue 5, the rejection of claim 31 under 35 USC 103(a) as unpatentable over Johnson (U.S. Patent 4,747,897) and further in view of Kodokian (U.S. Patent 5,762,741) is withdrawn. Furthermore, claim 31 is allowable subject matter absent any art showing it was known or expected in this environment, i.e. the art of bonding PTFE to a conductor, to add a contrasting dye to the thermosetting resin.

(7) Grouping of Claims

Appellant's brief includes a statement that claims 23-25, 29, 31-33, 35-37, 39-43, and 45-49 do not stand or fall together and provides reasons as set forth in 37 CFR 1.192(c)(7) and (c)(8).

Group 1: Claims 23-25, 29, 32-33, 40-42, and 46-49

Group 2: Claims 35-36 and 45

Group 3: Claim 31

Group 4: Claim 37

Group 5: Claim 39

Group 6: Claim 43

(8) Claims Appealed

The copy of the appealed claims contained in the Appendix to the brief is correct.

(9) Prior Art of Record

(A) Listing of Prior Art of Record

4,747,897	JOHNSON	5-1988
4,765,860	UENO et al.	8-1988
5,425,832	KUSANO et al.	6-1995
5,762,741	KODOKIAN	6-1998

The admitted prior art

(B) Brief Description of Prior Art of Record

Johnson discloses a method of bonding a dielectric material comprising polytetrafluoroethylene (PTFE) and filler material, e.g. ceramic, glass, metal, carbon, etc., to a

conductor such as a copper foil by impregnating the dielectric material with a liquid thermosetting resin, e.g. epoxy, polyimide, polyamide, etc. Johnson teaches the method comprises coating the dielectric material with the resin such that the resin fills the interstices within the dielectric material and forms an even coating of resin on the materials surfaces, heating the coated dielectric material to affect a B-stage cure thereby forming a dry, resin impregnated dielectric sheet, providing the resin impregnated sheet between one or two sheets of copper foil, and bonding the assembly through the application of heat (175 °C) and pressure (100-800 PSI) to form a single or double-sided printed circuit board.

Ueno et al. disclose a method for bonding a plastic base, e.g. PTFE and filler, to a metal foil, e.g. copper, using a thermosetting resin to form a printed circuit board wherein the surface of the base is subjected to a plasma process to enhance the bonding strength between the base and the foil.

Kusano et al. disclose heat pressing, i.e. bonding, a fluoropolymer sheet, e.g. PTFE, to a substrate, e.g. copper foil, using a thermosetting (epoxy) adhesive wherein the sheet is modified by plasma discharge treatment to provide a hydrophilic surface for improving adhesion between the sheet and substrate.

Kodokian discloses a method for heat and pressure bonding a polymer matrix, such as PTFE and filler material, to a composite layer comprising a conductive material, such as copper, using a thermosetting adhesive that comprises a thermoset and filler material.

The admitted prior art discloses bonding a dielectric material (PTFE matrix) to a conductive layer to form a laminated electrical substrate. The admitted prior art teaches the

dielectric material comprises nonfibrillated PTFE and filler particles that are evenly distributed, spherical in shape, and have a diameter of less than 10 microns.

(10) Grounds of Rejection

It is noted the previous 35 USC 112 rejection with respect to claim 48 is withdrawn.

It is noted the previous rejection of claim 31 under 35 USC 103(a) as unpatentable over Johnson (U.S. Patent 4,747,897) and further in view of Kodokian (U.S. Patent 5,762,741) is withdrawn. Furthermore, claim 31 is allowable subject matter absent any art showing it was known or expected in this environment, i.e. the art of bonding PTFE to a conductor, to add a contrasting dye to the thermosetting resin.

The following ground(s) of rejection are applicable to the appealed claims:

Claims 23, 25, 29, 32, 35, 36, 40-43, and 45 are rejected under 35 U.S.C. 102(b) as being anticipated by Johnson.

Johnson is directed to a method of bonding a dielectric material comprising polytetrafluoroethylene (PTFE) to a conductor such as a copper foil by impregnating the dielectric material with a liquid thermosetting resin. Johnson teaches a dielectric material comprising a fluorocarbon such as PTFE and filler material such as ceramic, glass, metal, carbon, etc. (Column 3, lines 5-16). Johnson teaches a liquid thermosetting resin such as epoxy, polyimide, polyamide, etc. (Column 3, lines 3-5). Johnson teaches coating the dielectric material with the thermosetting resin (Column 6, lines 29-31). The resin fills the interstices within the dielectric material and forms an even coating of resin on the materials surfaces (Column 7, lines 37-41). The coated dielectric material is heated to affect a B-stage cure (Column 4, lines 49-55 and Column 6, lines 32-34), and a dry, resin impregnated dielectric sheet is formed. The sheet is

then placed, i.e. provided, between one or two sheets of copper foil (Column 4, lines 59-63 and Column 6, lines 47-53). The bonding occurs through the application of heat (175 °C) and pressure (100-800 PSI) (Column 7, lines 53-58 and Column 8, lines 7-10). The laminate can be fabricated into a single or double-sided printed circuit board (Column 4, lines 66-68). It is noted a layer of resin is present on each surface of the dielectric material (bonded or not) after lamination because if the layer were not present the circuit board would delaminate (Figure 8 and Column 8, lines 1-4). It is further noted Johnson does not specifically recite a solvent included in the thermosetting resin. However, the resin would inherently include a solvent in view of the following: (1) Johnson teaches the thermosetting resin is applied as liquid, i.e. the resin is not applied as a melt and (2) After coating the dielectric material with the liquid thermosetting resin Johnson teaches the coated dielectric is dried such that if the resin were applied in a melt form there would be no need to dry the coated dielectric.

Claims 24, 33, and 46-48 are rejected under 35 U.S.C. 103(a) as being unpatentable over Johnson as applied to claims 23, 25, 29, 32, 35, 36, 40-43, and 45 above, and further in view of the admitted prior art (Specification pages 1-3 and page 8, lines 10-13).

Regarding claims 24 and 46-48, Johnson teaches all of the limitations in claims 24 and 46-48 as applied above except for a teaching on the specific properties of the dielectric material such as the PTFE is nonfibrillated and the particles are evenly distributed, spherical in shape, and have a diameter of less than 10 microns. However, it is noted Johnson teaches the dielectric material includes PTFE and filler particles. Dielectric material comprising PTFE and filler particles having the above properties is known in the art as shown by the admitted prior art. The admitted prior art is directed to bonding a dielectric material (PTFE matrix) to a conductive layer

to form a laminated electrical substrate. The admitted prior art teaches the dielectric material comprises nonfibrillated PTFE and filler particles that are evenly distributed, spherical in shape, and have a diameter of less than 10 microns (Specification pages 1-3 and page 8, lines 10-13). Absent any unexpected results, one of ordinary skill in the art at the time the invention was made reading Johnson in view of the admitted prior art would have readily appreciated using as the dielectric material taught by Johnson the dielectric material (i.e. a dielectric material comprising nonfibrillated PTFE and filler particles that are evenly distributed, spherical in shape, and have a diameter of less than 10 microns) suggested by the admitted prior art.

Regarding claim 33, Johnson teaches all of the limitations in claim 33 except for a teaching on forming a chip carrier. As noted in the admitted prior art (Specification pages 1-3) it is known to form chip carriers using a PTFE matrix bonded to a conductive material. One of ordinary skill in the art at the time the invention was made reading Johnson in view of the admitted prior art would have readily appreciated using the method suggest by Johnson to form a chip carrier as suggest by the admitted prior art as only the expected results would be achieved.

Claim 37 is rejected under 35 U.S.C. 103(a) as being unpatentable over Johnson as applied to claims 23, 25, 29, 32, 35, 36, 40-43, and 45 above, and further in view of Ueno et al. and Kusano et al.

Johnson teaches all of the limitations in claim 37 as applied above except for a teaching on subjecting the PTFE matrix to a plasma process prior to coating. It is well known in the art when bonding a PTFE matrix to a conductive material to first subject the PTFE matrix to a plasma process to provide the PTFE matrix with a hydrophilic surface thereby enhancing adhesion between the PTFE matrix and the conductor as shown for example by Ueno et al. and

Kusano et al. One of ordinary skill in the art at the time the invention was made reading Johnson in view of Ueno et al. and Kusano et al. would have readily appreciated modifying the method taught by Johnson to incorporate the well known plasma discharge technique shown for example by Ueno et al. and Kusano et al. to provide the PTFE matrix with a hydrophilic surface thus enhancing the adhesion between the PTFE matrix and the conductor.

Ueno et al. are directed to a method for bonding a plastic base to a metal foil using a plastic resin to form a printed circuit board wherein the surface of the base is subjected to a plasma process to enhance the bonding strength between the base and the foil (Column 2, lines 28-35 and 40-45). Ueno et al. teach a plastic base made of polyester, polyimide, or PTFE (Column 3, lines 14-18). The base is subjected to a plasma discharge (Column 3, lines 23-28 and 33-37). The base is then bonded to a metal foil, such as a copper foil, using a thermosetting adhesive (Column 5, lines 4-22), and the bonding occurs under pressure and at room temperature or an elevated temperature (Column 5, lines 23-31). Kusano et al. are directed to bonding a fluoropolymer sheet to a substrate using an adhesive wherein the sheet is modified by plasma discharge treatment to provide a hydrophilic surface for improving adhesion between the sheet and substrate (Column 1, lines 30-33 and 42-44 and Column 2, lines 10-17). Kusano et al. teach a fluoropolymer sheet comprising PTFE (Column 3, lines 48-50). Kusano et al. teach subjecting the sheet to a plasma discharge to form a hydrophilic surface (Column 6, lines 12-17). Kusano et al. then teach bonding the PTFE sheet to a copper foil using a thermosetting (epoxy) adhesive by well known means such as heating, pressing, and heat pressing (Column 6, lines 18-29 and 66-68 and Column 7, lines 1-3).

Claims 39 and 49 are rejected under 35 U.S.C. 103(a) as being unpatentable over Johnson as applied to claims 23, 25, 29, 32, 35, 36, 40-43, and 45 above, and further in view of Kodokian.

Johnson teaches all of the limitations in claim 39 as applied above except for a teaching on the thermosetting resin including filler materials and 30-75 percent solids. One of ordinary skill in the art at the time the invention was made reading Johnson in view of Kodokian would have readily understood using a thermosetting resin in the method taught by Johnson that includes filler materials as suggested by Kodokian as only the expected results would be achieved. As to the amount of filler material, i.e. the percent solids, one of ordinary skill in the art at the time the invention was made would have readily understood that when using a liquid thermosetting resin as taught by Johnson as modified by Kodokian the resin would have included less than 100% solids such that the resin has a range of <100 percent solids and the claimed range of 30-75 percent solids falls in that range.

Regarding claim 49, as to the solids (inorganic particles) impregnating the fluoropolymer matrix it is noted the dielectric material (fluoropolymer matrix) taught by Johnson is the same as that taught by applicant (a dielectric material comprising a fluorocarbon and filler material/particles). Furthermore, the solids in the resin suggested by Johnson as modified by Kodokian are substantially the same as that taught by applicant (organic particles). Therefore, the thermosetting resin with solids taught by Johnson as modified by Kodokian would impregnate the dielectric material in the same way as that taught by applicant, i.e. the solids would not impregnate the dielectric material.

Kodokian is directed to a method for bonding polymeric articles. Kodokian teaches heat and pressure bonding a polymer matrix, such as PTFE and filler material, to a composite layer

comprising a conductive material, such as copper, using a thermosetting adhesive that comprises a thermoset and filler material, e.g. organic particles (Column 3, lines 7-8, 11-13, 28-42, 56-58, and 63-67 and Column 7, lines 56-67 and Column 8, lines 1, 4-8, 19-23, 25-28, 66-67 and Column 9, 19-20).

(11) Response to Argument

It is noted the previous 35 USC 112 rejection with respect to claim 48 is withdrawn.

Group 1: Claims 23-25, 29, 32-33, 40-42, and 46-49

Claim 23

Applicants contend Johnson does not teach a layer of resin present on each surface of the dielectric material after the step of "laminating the resin-impregnated fluoropolymer matrix to a conductor". Applicants contend that it is physically impossible for a "layer" of resin to exist after the resin has been homogenously distributed within the fluoropolymer matrix. Applicants contend that from the definition of a layer a layer must have thickness and that there is essentially no thickness existing between the layers of fluoropolymer fabric following the final curing taught by Johnson. Applicants further contend that the descriptive text disclosed by Johnson relating to the distribution of the resin after bonding is given in "EXAMPLE 1" and Johnsons EXAMPLE 1 does not include "laminating the resin-impregnated fluoropolymer matrix to a conductor".

Johnson discloses a method of bonding a dielectric sheet comprising polytetrafluoroethylene (PTFE) and filler to a conductor sheet by impregnating the dielectric sheet with a liquid thermosetting resin. Johnson teaches coating a dielectric sheet with a liquid thermosetting resin, heating the coated dielectric sheet to form a dry, impregnated dielectric

sheet, providing at least one impregnated dielectric sheet between one or more conductor sheets, and laminating the assembly by applying heat and pressure. Johnson teaches in EXAMPLE 1 that after lamination "microscopic examination of cross sections of the laminated composite showed a uniform distribution of epoxy resin around the fibers, within the interstices of the fabric and between the layers of fabric" (emphasis added). It is noted that while EXAMPLE 1 does not disclose bonding the impregnated dielectric sheets to conductor sheets, EXAMPLE 2 teaches bonding the dielectric sheets to conductor sheets under the same conditions and materials as EXAMPLE 1 such that the description of the bonding provided in EXAMPLE 1 would apply equally to both examples and as such Johnson clearly teaches a layer of epoxy resin "between the layers of fabric". Thus, the limitation of claim 23 requiring "a remaining layer of resin" is satisfied. Furthermore, Figure 8 shows the bonded assembly. It is noted the sheets of dielectric and conductor would not laminate/bond to one another to form the printed circuit board without a layer of resin having some thickness present between each sheet such that the "layer of resin" required by claim 23 defines nothing more than what is shown by Johnson.

Group 2: Claims 35-36 and 45

Claim 35

Applicants contend it is not inherent for the resin to include a solvent. Applicants have cited Abe et al. (U.S. Patent 4,498,017) to show that it was known to perform a B-stage cure on a resin dissolved in a solvent and a resin without a solvent.

Johnson teaches applying a liquid thermosetting resin to the dielectric sheet followed by heating in an oven to form a dry, semi-cured (B-stage) impregnated sheet. The thermosetting resin taught by Johnson would not be applied in liquid, i.e. wet, form if a solvent were not

included, as the thermosetting resin would need to be applied in a melt, i.e. dry, state, and the step of heating the coated dielectric sheet to form a dry, semi-cured impregnated sheet would also be unnecessary if the resin were not applied with a solvent, as there would be nothing to dry/remove. Furthermore, in response to the reference (Abe et al.) cited by applicants it appears this reference supports the examiners position. Abe et al. teach forming a B-stage prepreg by two processes: (1) a wet process wherein a base material is wet with a resin dissolved in a solvent followed by drying the base material to remove the solvent and form a B-stage prepreg and (2) a dry process wherein a thermosetting resin is applied as a powder or paste to a base material followed by heating to melt the resin and form a B-stage prepreg. The process disclosed by Johnson is that of process (1) described by Abe et al. wherein the resin is applied to the base material as a liquid, i.e. wet, and the base is then heated to form a dry B-staged prepreg.

Group 3: Claim 31

It is noted the previous rejection of claim 31 under 35 USC 103(a) as unpatentable over Johnson and further in view of Kodokian is withdrawn. Furthermore, claim 31 is allowable subject matter absent any art showing it was known or expected in this environment, i.e. the art of bonding PTFE to a conductor, to add a contrasting dye to the thermosetting resin.

Group 4: Claim 37

Applicant contends neither Ueno et al. nor Kusano et al. discuss bonding the resin-treated fluoropolymer to a conductor by B-stage curing and subsequent C-stage curing. Applicant further contends Johnson teaches that bonding the resin-treated fluoropolymer to a conductor (prior to coating with a resin) by B-stage curing and subsequent C-stage curing is simpler to apply, and less expensive that said plasma process.

Ueno et al. and Kusano et al. are applied to show it is well known in the art when bonding a PTFE matrix to a conductive material to first subject the PTFE matrix to a plasma process to provide the PTFE matrix with a hydrophilic surface thereby enhancing adhesion between the PTFE matrix and the conductor. The bonding processes, i.e. heat and pressure, taught by Ueno et al. and Kusano et al. are substantially similar to that taught by Johnson such that it would have been well within the ordinary skill of one in the art at the time the invention was made to modify Johnson to include the well known plasma process shown for example by Ueno et al. and Kusano et al. As to applicants arguments that Johnson teaches away from a plasma process it is unclear where Johnson discusses a plasma process.

Group 5: Claim 39

Applicants contend one of ordinary skill in the art at the time the invention was made would not have readily understood that when using liquid thermosetting resin as taught by Johnson the resin would include no more than 75% solids.

One of ordinary skill in the art would readily appreciated that the liquid thermosetting resin taught by Johnson as modified by Kodokian would include less than 100% solids such that the range of 30-75 percent solids would be included.

Group 6: Claim 43

Applicants contend Johnson does not disclose "wherein the fluoropolymer matrix is impregnated with the thermosetting resin, prior to the providing step".

Claim 23 requires a method comprising the following steps in any order (1) "providing a fluoropolymer matrix... ", (2) "coating a thermosetting resin on the fluoropolymer matrix", (3) "processing the fluoropolymer matrix with the resin coated therein such that material from the

resin impregnates the fluoropolymer matrix..." etc. Claim 43 requires "the fluoropolymer matrix is impregnated with the thermosetting resin, prior to the providing step". It is noted claims are interpreted in view of the specification however limitations should not be read into the claims from the specification such that a reasonable interpretation of claim 43 requires the coating and processing steps of claim 23 to occur prior to the providing step as opposed to claim 23 where the steps can occur in any order. The order required by claim 43 is clearly shown by Johnson wherein the fluoropolymer matrix is coated and processed to form a B-staged prepreg and then provided for bonding to additional substrates. It is also noted applicants have not previously taken issue with this interpretation.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

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